

Claims

What is claimed is:

- 1 1. A composition suitable for use as a planarizing underlayer in a multilayer  
2 lithographic process, said composition comprising:
  - 3 (a) a polymer containing:
    - 4 (i) cyclic ether moieties,
    - 5 (ii) saturated polycyclic moieties, and
    - 6 (iii) aromatic moieties, and
  - 7 (b) an acid generator.
- 1 2. The composition of claim 1 wherein said cyclic ether moieties are pendant  
2 from acrylate monomers, said monomers forming at least a portion of said  
3 polymer.
- 1 3. The composition of claim 1 wherein said polycyclic moieties are pendant  
2 from acrylate monomers, said monomers forming at least a portion of said  
3 polymer.
- 1 4. The composition of claim 1 wherein said polycyclic moieties are located in  
2 a backbone portion of said polymer.
- 1 5. The composition of claim 1 wherein said aromatic moieties are pendant  
2 from an ethylenic monomer, said monomer forming at least a portion of  
3 said polymer.
- 1 6. The composition of claim 5 wherein said aromatic moieties are selected  
2 from the group consisting of phenyl and phenol.

1    7. The composition of claim 1 wherein said polymer contains acrylate  
2               monomers having both an polycyclic moiety and a cyclic ether moiety  
3               pendant from said monomer.

1    8. The composition of claim 1 wherein said acid generator is a thermally  
2               activated acid generator.

1    9. The composition of claim 1 wherein said acid polymer further comprises  
2               fluorine-containing moieties.

1    10. The composition of claim 1 wherein said composition consists essentially  
2               of components (a) and (b).

1    11. A lithographic structure on a substrate, said structure comprising:  
2               (a) a planarizing underlayer comprising:  
3                       a polymer containing:  
4                               (i) cyclic ether moieties,  
5                               (ii) saturated polycyclic moieties, and  
6                               (iii) aromatic moieties, and  
7                       an acid generator.  
4               (b) a radiation-sensitive imaging layer over said planarizing underlayer.

1    12. The structure of claim 11 wherein said layers are patterned such that  
2               portions of said substrate are exposed.

1    13. The structure of claim 11 wherein said imaging layer is a silicon-containing  
2               resist.

1 14. A method of forming a patterned material feature on a substrate, said  
2 method comprising:

3 (a) providing a material layer on a substrate,

4 (b) forming a planarizing layer over said material layer, said  
5 planarizing layer being formed by reacting a planarizing underlayer  
6 composition, said underlayer composition comprising

7 a polymer containing:

8 (i) cyclic ether moieties,

(ii) saturated polycyclic moieties, and

(iii) aromatic moieties, and

11 an acid generator,

12 (c) forming a radiation-sensitive imaging layer over said planarizing  
13 layer,

14 (d) patternwise exposing said imaging layer to radiation thereby  
15 creating a pattern of radiation-exposed regions in said imaging  
16 layer,

17 (e) selectively removing portions of said imaging layer and  
18 planarizing layer to expose portions of said material layer, and

19 (f) etching said exposed portions of said material layer, thereby  
20 forming said patterned material feature.

1 16. The method of claim 14 wherein said radiation is ultraviolet radiation  
2 having a wavelength less than 200 nm.

1 17. The structure of claim 14 wherein said imaging layer is a silicon-containing  
2 resist.

1 18. The method of claim 14 wherein said material layer is selected from the  
2 group consisting of dielectric, metals, and semiconductors.

1 19. A composition suitable for use as a planarizing underlayer in a multilayer  
2 lithographic process, said composition comprising:

- (a) a polymer containing:
  - (i) saturated polycyclic moieties, and
  - (ii) aromatic moieties,
- (b) an acid generator, and
- (c) a crosslinker.

1 20. The composition of claim 19 wherein said polymer further comprises  
2 pendant hydroxyl moieties.